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Fish Fauna of Rancho Grande, Venezuela.¹

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INTRODUCTION.

[This is one of a series of papers resulting from the 45th and 46th Expeditions of the Department of Tropical Research of the New York Zoological Society, made during 1945 and 1946 under the direction of Dr. William Beebe with headquarters at Rancho Grande in the National Park of Aragua, Venezuela. The expeditions were made possible through the generous cooperation of the National Government of Venezuela and of the Creole Petroleum Corporation.

[The characteristics of the research area are brief as follows: Rancho Grande is located in north central Venezuela ($10^{\circ} 21' N.$ Lat., $67^{\circ} 41' W.$ Long.), 80 kilometers west of Caracas, at an elevation of 1,100 meters in the undisturbed montane cloud forest which covers this part of the Caribbean range of the Andes. Adjacent ecological zones include seasonal forest, savanna, thorn woodland, cactus scrub, the fresh water lake of Valencia, and various marine littoral zones. The Rancho Grande area is generally subtropical, being uniformly cool and damp throughout the year because of the prevalence of the mountain cloud cap. The dry season extends from January into April. The average humidity during the expeditions, including parts of both wet and dry seasons, was 92.4%; the average temperature during the same period was $18^{\circ} C$; the average annual rainfall over a 10-year period was 174 cm. The flora is marked by an abundance of mosses, ferns and epiphytes of many kinds, as well as a few gigantic trees. For further details, see Beebe & Crane, *Zoologica*, Vol. 32, No. 5, 1947. Unless otherwise stated the specimens discussed in the present paper were taken in the montane cloud forest zone, within a radius of 1 kilometer of Rancho Grande.]

INTRODUCTION.

Within the limits of our researches at Rancho Grande living conditions for fish were so poor that only three species were represented. Two of these were characins, which without special adaptations could make their way up low rapids to the limit of permanent pools in the upper middle reaches of the brooks feeding the Rio Lison, south of the Portachuelo Pass watershed.

The smaller and more precipitous streams on the north side of the divide were inhabited by a single species of catfish, *Pygidiun*. This, like most members of its family, was adapted for life and progress in

swift currents and restricted pools. The opercles and interopercles were armed with rows of projecting spines, and by alternate movements of these gill covers the fish could cling to steep rocks, and progress against gravity and force of water with remarkable success. The mobile, eel-like body and flattened fins were all of help.

Under laboratory conditions these fish showed pronounced ability to leap, yet I never saw any salmon-like jumps in nature, whereas several times the fish were observed hitching themselves, little by little, up the steep sides of rocks and through water trickling from one small pool to another.

Brown-spotted Pygidium.

Pygidiun b. banneai Eigenmann.

Pygidiun banneai Eigenmann; *Indiana Univ. Studies*, no. 16, 1912, p. 19; *Mem. Carnegie Mus.*, vol. 7, 1918, no. 5, p. 318.

These catfish belong to the subfamily Pygidiinae, which are mostly of small size, and have unpleasant reputations of being parasitic on the skins of other fish, and actually entering and living within the gill cavities of large catfish. The catfish of Rancho Grande must seek more normal methods of livelihood, for there are no other fish in the upper reaches of these mountain streams. Their habitat is typical, for *Pygidiun* as a whole is confined to streams of the higher Andes, living as high as three miles above sea level.

Habitat. Ten minutes away from Rancho Grande brings us to a small brooklet. It crosses the main road by a stone and cement culvert, and from here on down the valley it drops steeply, enters the Rio Ocumare and finally ends, six miles north, in the Caribbean. Near the culvert we found specimens of this fingerlong catfish, the only fish able to ascend this steep succession of falls and small pools, to exist in periods of drought when the stream becomes a drop-by-drop trickle, and to withstand the change to a roaring torrent resulting from cloud-bursts during the height of the rains.

General. The first of this species were taken on April 17, 1946. There were two large ones (60 mm. standard length), and three small (20 mm.).

In seventeen other pools of this same

stream, small individual catfish were taken in twelve; large, apparent adults in three more; while two pools were without fish.

When disturbed, the fish wriggled along the bottom, and when alarmed pushed under dead leaves. Fear was a minor sensation with them, perhaps due to the absence of kingfishers and herons. Nevertheless I came suddenly upon a large *Belostoma* water-bug, a three-inch menace to fish and frogs.

On May 22 more small fish were taken from four other small brooks crossing the road along the same stretch as catfish brook number one, all within a half kilometer. None were taken more than thirty meters above the culverts.

On July 4 I collected a number of fish with a few explosive caps. The first pool above the culvert measured two feet by a foot and a half, by a few inches deep, half filled with leaf debris, over a gravelly bottom. The explosion sent a small geyser of water into the air, but for a time there were no visible results. Then several catfish came into view, moving slowly close to the bottom. The only effect was a complete disregard of the hand net. We scooped up twelve in a few minutes. None of them came to the surface as do tide-pool fish, but only swam about slowly, pushing under pebbles and leaves. The largest ones showed subdermal congestion when examined closely, and ultimately died. All of small and medium size recovered. The largest was 73 mm. in standard length.

Color in Life. In a large specimen the upper surface down to the lateral line was cinnamon buff, below fleshy white, immaculate. A line of very faint darker buff marks extended down midline of back, ending at dorsal. On each side a series of unconnected, irregular, dark blotches of all shapes extended to tail. Below this, on the midsides, an almost solid line of dark buff, breaking up posteriorly, reached the tail. On top of head two distinct longitudinal lines were behind the eyes, greenish in life. Two irregular, dark buff blotches on gill covers.

The pattern and colors of the young fish were like those of the larger, except that they were more distinct and linear, less broken into blotches. After three weeks in an aquarium the pigment showed a decided tendency toward breaking into unconnected blotches.

Eye. In the larger fish the eye was 1 mm. in diameter, protuberant, and when at rest directed outward. In extreme movement the eyeball had a vertical rotation of at least 50 degrees, the direction of vision changing from almost lateral to more nearly superior.

Position in Life. The fish rested flat on the bottom of the pool, often beneath a leaf or stone. Pectorals spread wide, flat on bottom, outer elongated ray (ca. 8.6 mm. in length) 45 degrees out from body. Between it and the body the fin fanned out. Lower maxillary

barbel flat, curved obliquely back; upper one slightly raised, obliquely forward, tip curve backward; narial barbel forward, 20 degrees out and back from longitudinal.

Gill Covers in Life. These were divided into two lobes, one above the other, the lower one larger. There were at least thirteen opercular spines projecting through the skin of the lower lobe, arranged in two irregular rows. The distal row, eight in number, penetrated the skin in the shape of slender curved, sharp, tooth-like spines. Four or five considerably smaller, projected from the lesser, upper lobe. When the fish was frightened and moved toward the shelter of pool debris, the gill covers could be seen to move independently, and apparently aided the pectorals in forward progression. They must be of decided help in clinging fast to rock crevices and vertical surfaces in swift currents.

Viability. In August we killed the last of the small catfish taken in May. It had increased three mm. in length, and had become somewhat darker in color. For three months it had lived in perfect health, without provided food, in a glass laboratory dish two and a half, by three and a half, by one inch deep, loosely covered, half filled with unchanged water which was thick and opaque with green algal scum.

Terrestrial Locomotion. A fish of medium size (35 mm.) when placed on a dry cement floor instantly flipped a distance of twenty-three inches. It rested four seconds and then cleared twenty-five inches, then fifteen more, ten seconds rest, and two leaps of six and fourteen inches. Two minutes' rest was followed by three flips of two, four and thirteen inches; then a period of wriggling and futile flipping within an area of five inches; a final high effort of eighteen inches and I returned it to its aquarium, very dusty but quite unharmed. For two minutes it hid beneath a leaf and then leaped out upon the floor. A characin under the same conditions merely twisted and wriggled for a minute and then gave up.

Food. In addition to much comminuted vegetable matter, we recorded as additional food an aquatic dragonfly larva, together with two small beetles and a fly which had probably fallen into the pool.

Characins.

Directly in front of Rancho Grande several small streams had their origin, streams which made their way down the steep valley to the south of Portachuelo Pass. Far down at the bottom all of these merged with the Rio Limon, which reached a width of several meters as it flowed over the relatively flat lowlands, and finally emptied into Lake Valencia miles away. The upper reaches of these brooklets were too small for any fish but before they lost themselves in the large stream the small pools, connected by less precipitous falls, were inhabited by two spe-

ees of characins. These were *Hemibrycon dentatus metae* and *Creagrutus beni*. Both were found in equal abundance just before the junction of the tributaries and main stream, but higher up, even past the culvert and on up the northern slopes, *Creagrutus* still persisted in rather swift currents.

Dark-tailed Characin.

Hemibrycon dentatus metae Myers.

Hemibrycon dentatus metae Myers, Proc. Biol. Soc. Washington, vol. 43, 1930, p. 68; Schultz, Proc. U. S. Nat. Mus., vol. 95, 1944, p. 363.

A single discharge of a small explosive cap on July 22, 1946, in a lower pool, yielded sixteen of these small but colorful characins. They varied from 60 to 105 mm., in standard length, the largest weighing thirteen grams.

Color in Life. Dark silvery blue above, changing to bright silver. Below silvery white. Five specimens had a dark, diffused, shoulder spot, absent in the others. All showed a broad, pale lateral band, and a lateral, jet-black band on the caudal peduncle, extending back to the tips of the mid-caudal rays. Caudal fin either clear or with distinct dusky area above and below, with a strong tinge of lemon yellow or pink on the proximal portion of the fin. In the largest specimens there was a dusky area on the dorsal fin. Anal strongly dusky along the tips of the rays, bright pink on the anterior rays. Upper part of eye bright red.

Food. The largest fish (105 mm.) had just eaten a large (50 mm.) brightly colored sphinx caterpillar, not quite dead. Three other fish had the following in their stomachs: (a) dragonfly larva, cicadellid, membracid, beetle larva, dipteran, vegetable matter and quartz grains; (b) Cassidini, caddisfly larva, dipteran larva, dragonfly larva, a fly and an aphid; (c) small moth and dragonfly nymph.

Pink-tailed Characin.

Creagrutus beni Eigenmann.

Creagrutus beni Eigenmann, Ann. Carnegie Mus., vol. 7, 1911, no. 1, p. 172; Schultz, Proc. U. S. Nat. Mus., vol. 95, 1944, p. 336.

Many of these were collected in the lower and middle reaches of the southward flowing streams. Twenty-nine were taken with a single cap on July 22, 1946, measuring from 21 to 80 mm.

Color in Life. Dark olive above and on sides, except for a broad, very pale silvery blue lateral band. Below, anteriorly whitish with body organs showing through; posteriorly olive. Faint, indistinct peduncular duskiness. Basal half of caudal greenish-yellow, then a large dusky area. Distal portion, especially under lobe, pink, varying to scarlet in some individuals. This tail pattern the same in all sizes, small and large. In small fish and some of medium size the lateral silvery band was dusky on the posterior third. Distal parts of pelvic and anal rays bright lemon. Iris scarlet on upper fourth, silvery and dusky elsewhere.

Food. Two specimens contained the following: (a) firefly larva and unknown insect; (b) small caterpillar, beetle and unknown aquatic larva.

Viability. A 40 mm. *Creagrutus* was kept for five weeks in a quart jar in the laboratory, with unchanged water and no provided food. When killed at the end of this period it was as active as ever, with no diminishing of coloration. The only change was a dense growth of green algae on the rays of the caudal.

Note: I have to thank Dr. Leonard P. Schultz for the identification of the three species. The specimens are divided between the United States National Museum and the collections of the Department of Tropical Research of the New York Zoological Society. The department catalogue numbers are, *Pygidium banneaei banneaei* 30627, 30716, 30831, 30941. *Hemibrycon dentatus metae* 30868, 30892, 30986. *Creagrutus beni* 30869, 30870, 30940.

